Data and Methods

- standard Coreference Resolution systems have been developed on newspaper texts
- moderate performance on German novels because of domain differences
  - more pronouns
  - more direct speech
  - few large clusters with long coreference chains
- rule-based system with 11 passes ordered by decreasing precision, similar to [Lee et al. 2005]
  - explanation component facilitates error analysis and rule refinement
  - no large annotated novel training corpus available
- manually annotated corpus sampled from about 80 novels for development and evaluation

Scores in % Our system evaluated with the novel corpus

<table>
<thead>
<tr>
<th>Passes</th>
<th>MUC-F1</th>
<th>B³-F1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27.5</td>
<td>24.6</td>
</tr>
<tr>
<td>1-4</td>
<td>37.7</td>
<td>28.1</td>
</tr>
<tr>
<td>1-9</td>
<td>38.5</td>
<td>28.9</td>
</tr>
<tr>
<td>1-11</td>
<td>38.5</td>
<td>28.6</td>
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</tbody>
</table>

Coreference Resolution in 11 Passes

1. **exact match**
   All identical non-pronouns are marked as coreferent, also if their cases differ

2. **nameflexion**
   Distance metric to detect derivatives of names or nicknames ("Lydia", "Lyden", "Lydchen")

3. **attributes**
   Modifiers are matched against NEs of other clusters ("die alte Gertrud", "die Alte")

4. **precise constructs**
   Appositions, relative and reflexive pronouns are assigned to the preceding NE. Subsequently, the pronouns get the number and gender of the matched NE.

5. **strict head match**
   Two NEs consisting of more than one word are marked as coreferent if at least one word occurs in both strings and they agree in gender and number.

6. **relaxed head match**
   One word of one NE is contained in a word of the other NE and they agree in gender and number.

7. **title match**
   Titles are matched to the most recent NE containing the given title. This title match pass is necessary as titles are disregarded in passes 5 and 6.

8. **semantic pass**
   Match synonyms using GermaNet if they agree in gender ("Gatte", "Gemahl")

9. **pronoun resolution**
   Pronouns are resolved to the most recent, suitable preceding NE

10. **addressee detection in direct speech**
    For each direct speech, the addressed person is identified using lexico-syntactic patterns

11. **pronouns in direct speech**
    Resolve all instances of "I" to the speaker and all instances of "you" to the addressee

Error Analysis

Explanation and annotation editor
- on-click display of key attributes for each NE token
- highlighting of direct speech and speaker
- possible classification of coreference errors according to their type

Categories of errors
- 14% of total errors due to wrong assignment of gender, number or person and direct speech respectively, to be improved with more precise grammatical constraints

Results

- better results than state-of-the-art system CorZu [Klenner 2011]
- pronoun resolution (pass 9) brings by far the most improvement
- 86.0% MUC-F1 and 55.5% B³-F1 on completely unseen data

References
